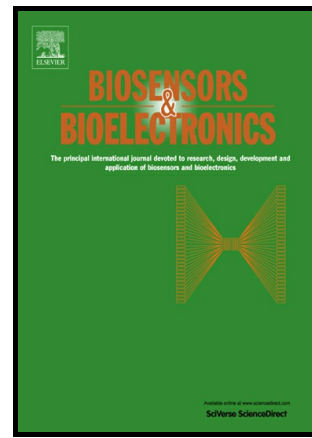


Author's Accepted Manuscript

Rapid Detection of Single *E. coli* Bacteria Using a Graphene-based Field-Effect Transistor Device

Bhawana Thakur, Guihua Zhou, Jingbo Chang, Haihui Pu, Bing Jin, Xiaoyu Sui, Xiaochen Yuan, Ching-Hong Yang, Matthew Magruder, Junhong Chen



PII: S0956-5663(18)30178-7
DOI: <https://doi.org/10.1016/j.bios.2018.03.014>
Reference: BIOS10340

To appear in: *Biosensors and Bioelectronic*

Received date: 1 January 2018
Revised date: 16 February 2018
Accepted date: 6 March 2018

Cite this article as: Bhawana Thakur, Guihua Zhou, Jingbo Chang, Haihui Pu, Bing Jin, Xiaoyu Sui, Xiaochen Yuan, Ching-Hong Yang, Matthew Magruder and Junhong Chen, Rapid Detection of Single *E. coli* Bacteria Using a Graphene-based Field-Effect Transistor Device, *Biosensors and Bioelectronic*, <https://doi.org/10.1016/j.bios.2018.03.014>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Rapid Detection of Single *E. coli* Bacteria Using a Graphene-based Field-Effect Transistor Device

Bhawana Thakur^a, Guihua Zhou^a, Jingbo Chang^a, Haihui Pu^a, Bing Jin^a, Xiaoyu Sui^a,
Xiaochen Yuan^b, Ching-Hong Yang^b, Matthew Magruder^c, and Junhong Chen^{a*}

^aDepartment of Mechanical Engineering, University of Wisconsin-Milwaukee, 3200 North Cramer Street, Milwaukee, Wisconsin 53211, United States

^bDepartment of Biological Sciences, University of Wisconsin-Milwaukee, Wisconsin 53211, United States

^cMilwaukee Metropolitan Sewerage District, Milwaukee, Wisconsin 53211, United States

ABSTRACT

Contamination of surface and drinking water due to the presence of *Escherichia coli* bacteria is a major cause of water-borne disease outbreak. To address unmet challenges for practical pathogen detection in contaminated samples, we report fabrication of thermally reduced graphene oxide-based field-effect transistor (rGO FET) passivated with an ultrathin layer of Al₂O₃ for real-time detection of *E. coli* bacteria. The sensor could detect a single *E. coli* cell within 50 s in a 1 μL sample volume. The ultrathin layer of Al₂O₃ acted as a barrier between rGO and potential interferents present in the sample. *E. coli* specific antibodies anchored on gold nanoparticles acted as probes for selective capture of *E. coli*. The high density of negative charge on the surface of *E. coli* cells strongly modulates the concentration of majority charge carriers in the rGO monolayer, thereby allowing real-time monitoring of *E. coli* concentration in a given sample. With a low detection limit of single cell, the FET sensor had a linear range of 1-100 CFU in 1 μL volume of sample (i.e., 10³ to 10⁵ CFU/ mL). The biosensor with good selectivity and rapid detection was further successfully demonstrated for *E. coli* sensing in river water. The rGO-based FET sensor provides a low cost and label-free

Download English Version:

<https://daneshyari.com/en/article/7229397>

Download Persian Version:

<https://daneshyari.com/article/7229397>

[Daneshyari.com](https://daneshyari.com)